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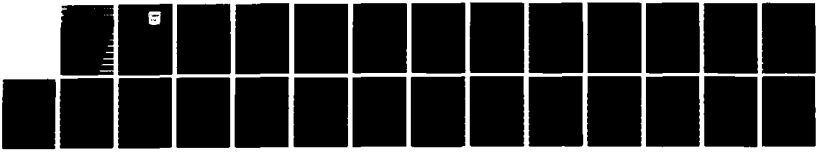

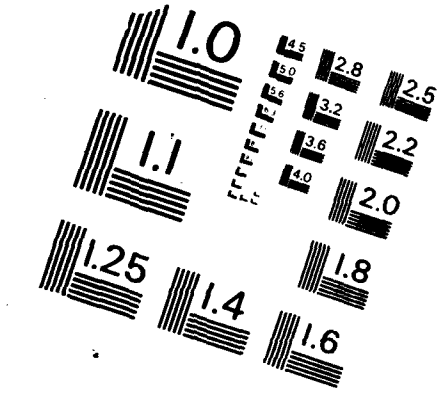

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STUDENT ESSAY

EMERGING TRAINING TECHNOLOGIES AND THE ARMY NATIONAL GUARD

BY

COLONEL JOHN F. KANE, AR

21 MARCH 1986

US ARMY WAR COLLEGE, CARLISLE BARRACKS, PENNSYLVANIA

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The basic question is whether or not emerging training technologies, i.e., devices and simulators, can help the National Guard meet training and readiness goals. Data was gathered using a literature search as well as talks with training personnel in the Department of the Army. The cost of training has grown considerably during the past several years. Fuel and ammunition cost more, and equipment is more complex. In the beginning, simulators and devices were not fielded to the National Guard at the same

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USAWC MILITARY STUDIES PROGRAM PAPER

EMERGING TRAINING TECHNOLOGIES AND THE ARMY NATIONAL GUARD

AN INDIVIDUAL ESSAY

by

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21 March 1986

ABSTRACT

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The basic question is whether or not emerging training technologies, i.e., devices and simulators, can help the National Guard meet training and readiness goals. Data was gathered using a literature search as well as talks with training personnel in the Department of the Army. The cost of training has grown considerably during the past several years. Fuel and ammunition cost more, and equipment is more complex. In the beginning, simulators and devices were not fielded to the National Guard at the same time they were fielded in the active Army. This, in spite of the fact, that most National Guard units have limited access to maneuver areas and firing ranges. The Army now considers the National Guard in it's device and simulator development and procurement plans. The National Guard has developed some of its own devices and simulators and is now, or will shortly be, receiving large quantities of commercially produced devices and simulators. It has been reasonably well established, that properly utilized devices and simulators provide realistic training that allows the individual or crew to perform as though they were operating the actual piece of equipment. We can expect to see a continued increase in the individual and collective readiness of the Guard with the increased use at home station of devices and simulators, integrated with intensive training periods at major training sites.

When the United States Army completed it's withdrawal from the Republic of South Vietnam in the early 1970's, it faced a period of decreasing size and shrinking funds. The Army's leadership realized that with a much smaller Active Army, it would be hard pressed to meet it's world wide commitments during a general war. The draft had been abolished, so the Army could no longer look to it for future expansion of its structure during the early phases of any future conflict. In view of these facts, a decision was made to increase reliance on the Reserve Component (RC); the Army National Guard (ARNG) and the United States Army Reserve (USAR).

For years the Reserve Component had struggled along with hand-me-down equipment from the active Army. They had conducted training primarily at the squad, platoon and sometimes, company level, comforted by the knowledge that in time of mobilization, they would be afforded ample training time to accomplish battalion, brigade and division level training prior to deployment. The Reserve Component also felt the pain of the abolition of the draft. During the Vietnam years, it had enjoyed full units and waiting lists because of the desire to avoid the draft. Now with the draft gone, that incentive to join reserve units was also gone.

A new era had dawned for the Reserve Component. Slowly the Army began a program of adding new types of units and

deleting those units no longer required to meet the Army's wartime missions. Equipment new to the Reserve Components (although certainly not new) was provided. Nowhere was this change more dramatic than in the aviation units, where Korean war vintage aircraft were exchanged for OH-58's, UH-1's, CH-47's and CH-54's. Ground units underwent similar, though possibly less dramatic, equipment changes. Army Training Programs (ATP) were replaced with Army Training and Evaluation Programs (ARTEP) which included more realistic training requirements based on tasks, conditions and standards. Coincidently, the Army started to look at its plans for mobilization and deployment. Some National Guard units were assigned to round out Active Army units while others were assigned equally high priority missions. Both missions required the ability to deploy in days instead of months. Subsequent changes to the Army's mobilization and deployment plans required virtually all National Guard units to be deployed within 90 days of mobilization, leaving very little time for training after mobilization.

With all of these changes, it became readily apparent that training in the National Guard must become more dynamic and better utilize the 39 days of available training time to focus on the essential wartime missions of the unit. During this period of time, inflation impacted heavily on the cost of training. Ammunition that had been relatively

inexpensive, in some cases, now cost hundreds of dollars per round for larger caliber ammunition, and thousands of dollars per round for missiles. Additionally, units that had been required to fire only during their Annual Training periods, were now faced with the requirement to do proficiency firing throughout the year. For units located in large metropolitan areas, long distances from firing ranges and maneuver areas, this posed an especially serious problem. It was rapidly becoming obvious that National Guard units, especially the heavy units, needed a new way to train which would let them conduct meaningful crew, section, squad and platoon training at the local armory.

Training devices and simulators were just beginning to find their way into the Active Army, and appeared to be an effective means of training soldiers. The question still to be answered, however, was just how skills acquired using these new devices and simulators related to skills acquired using the actual equipment and shooting full caliber rounds. Not only had the Army not answered that basic question, but it had failed to include the Reserve Component in most of it's device and simulator buys, thus depriving the very units most in need of new training technology from acquiring it.

The Department of Army Inspector General looked into the problem and found there was basically no one in charge of the device and simulator program. He found that devices already procured for the Active Army were not being used

though the Army had spent large sums of money for their procurement.

The Defense Science Board at the conclusion of their 1982 Summer Study on Training and Training Technology said that the Department of the Army must get serious about using available technology, and specifically, apply that technology to meet the training needs of the Reserve Component. It was their recommendation that tailored training support material be delivered to the Reserve Component. The Secretary of Defense approved the Defense Science Board recommendations and on 25 February 1983 asked the Service Secretaries to accelerate efforts to apply technology to meet the training needs of the Reserve Component. He stated that "this investment has the potential for very high payoff and merits a high priority."[1]

With the lack of a cohesive program at the Department of Army level to manage devices and simulators, the Army Directorate of the National Guard Bureau decided that it had to develop its own requirements for training devices and simulators as well as a strategy to support those requirements. In short NGB felt that any training devices for the National Guard must:

- Be affordable to the extent that one device could be placed at each armory where the type of unit which would use it drills.

- The device must be capable of providing training for more than one or two soldiers at a time.

- The device must simulate operation of the actual piece of equipment. And,

- It must sustain individual tasks by developing crew, squad, and platoon drills. Additionally, NGB developed an interlocking training strategy which stated that:

- Devices must be developed which can be used to train through platoon level at the armory.

- Local training areas must be developed which can be used to train through company level to include company/team combined arms live fire exercises or their subcaliber/Multiple Integrated Laser Engagement System (MILES) equivalents.

- Annual training must be conducted at major training areas where battalion task forces can maneuver and conduct combined arms live fire training.[2]

Although the requirements developed by NGB, as listed above, place the emphasis on devices that are affordable enough to be placed at each armory location, it must be recognized that there are device requirements which are simply too costly, or which have manpower constraints which preclude positioning at numerous locations. In such cases, they must be located at regional training sites where they can best support the maximum number of units. A good example of this is the Training Set Fire Observation (TSFO) which (1) is expensive, and (2) requires trained operators who work constantly with the equipment in order to develop

and maintain the required expertise to provide the desired training to the using units.

As of this writing, there does not appear to be a published requirement in the Army for a requirements document in the simulation and/or device development cycle to address the unique training requirements of the Reserve Component. The document which is generated in the training community and delivered to the development and acquisition agencies to start the device procurement cycle is the Training Device Requirement (TDR) document. This document explains the device, describes the requirement, lists the tasks it must teach/sustain, and describes the circumstances under which it is to be used. There is no mechanism available to ensure the tailoring of a device to satisfy those Reserve Component unique needs. A primary example of this is the Conduct of Fire Trainer (COFT) for armor units. As planned for the Active Army, the COFT is a stationary device set on a concrete pad in the battalion area. When the COFT was programmed for the National Guard (somewhere near the end of the development cycle) changes had to be made to make it mobile to meet the training requirements of a battalion spread over a large geographical area. Although devices are being programmed for delivery to the Reserve Component in greater quantity than ever before, none have been specifically tailored for the Reserve Component training environment. The National Guard Bureau has recommended to the Department of the Army that every TDR for field simulation

and/or devices address, in detail, how the device will function in the reserve environment and, specifically, how it will meet their training needs. The National Guard Bureau feels that if this recommendation is approved it will eventually result in the delivery of training support materials to the Reserve Component which have been tailored for their unique needs, which was part of the original recommendation made by the Defense Science Board in 1982.[3]

The first time National Guard units were involved with the use of high technology devices and simulators on a large scale was in the summer of 1982. TRADOC'S Army Training Support Center at Ft Eustis, VA asked the National Guard Bureau if it would help evaluate a portion of the Weapons Crew Training Study (WCTS) as it applied to tank gunnery. The National Guard Bureau agreed, and in coordination with the Adjutant General, Idaho, the Gowen Field range complex at Boise, Idaho was selected as the test site. The tank crewmen would come from the National Guard's 116th Armored Cavalry Regiment (ACR) located in Idaho and Oregon. Fifty-four volunteer armor crewmen from the 2/116 and 3/116 ACR were identified as potential subjects in the experiment with the intent of forming 12 four man crews. Two groups of six crews each were assigned either to the control group or the test group. The training program for the control group consisted of the normal program conducted by the 116th ACR in preparation for their annual qualification. This program involved firing Tank Tables I through IVB on an enclosed

mini-tank range (described later in this article), using both the Brewster mounted M-55 laser and .22 caliber. They then went to the field and fired Tank Tables VIA and B using the Telfare subcaliber device. This was followed by qualification runs on Tank Table VIII using full caliber ammunition.[4]

The training program for the test group consisted of initial gunner's and tank commander's training on the Preceptronic's MK60 gunner trainer simulation device, Tank Tables I through IVA on the Detras Mark IIIA Tank Gunnery and Missile Target System (TGMTS), and Tank Table IVB on the enclosed mini-tank range. In the field, the test group conducted stationary firing at a manned, hardened, and maneuvering M114 vehicle configured as a 0.6 scale T-62, using a tube-mounted .50 caliber spotter rifle with frangible ammunition. Because of technical difficulties, the M114 was not used during the night phase and the test group fired the same night course as the control group. Next, the test group fired a modified Tank Table VII using the Full Crew Interactive Simulator (FCIS) system. The FCIS consisted of an M60 tank equipped with the standard Multiple Integrated Laser Engagement System (MILES) for tanks, a Loader Trainer, and a through the sight video recording system. The FCIS fired at the Automatic Tank Target System (ATTS) which had an integrated laser interface device, and the MILES laser detector. This would cause the ATTS to fall when hit by the laser from the FCIS. This same system was

also integrated with the M31 Infantry Target System for machine gun engagements. Also used was an M551 visually modified (VISMOD) to represent a Soviet T62 tank, and an M113 VISMOD representing a Soviet BMP. Both were used as maneuvering targets and were equipped with MILES sensors to indicate hits. The conclusion that can be drawn from this experiment is simulation-based training might allow a majority of tank training for the Reserve Component to be done at their home armories. This might permit more cross training within crews, allow more time at Annual Training to be devoted to training other than gunnery, as well as to allow the full caliber ammunition currently utilized in gunnery training to be allocated to other types of collective training above the crew level.[5]

This experiment ultimately resulted in a decision by the Department of the Army to buy the MK60, TGMTS and FCIS devices in sufficient quantity for National Guard armor units to conduct training with them. However, as of this writing, these devices are still not fully fielded. This is however, not unusual. Training devices and simulators are considered as hardware that must undergo the same development and operational testing cycle as a major item of equipment. As a result, it takes much too long to develop and field them. Army training requirements that were approved in 1972, for example, were still active requirements in 1981. As long as we use traditional approaches to acquisition of training devices and simulators, it will

continue to be difficult, if not impossible, to field a fully capable sophisticated training device or simulator concurrent with the weapon system initial operational capability (IOC).[6]

Even though the Army has not been prompt in developing and fielding training devices and simulators, the soldiers have been busy filling the void with their own creations. Take for instance the indoor mini-tank range built at a major National Guard training center using salvaged material, locally manufactured items and a vacant warehouse. The range is 1:60 scale designed for use with a .22 caliber weapon mounted on a tank gun tube with the Brewster device firing 15 grain frangible ammunition, or with the M55 laser device. The range has both pop-up stationary targets and moving targets. Engagement ranges vary from 800 to 2400 meters (scaled range) and can be fired under daylight conditions (building interior lights on) or at night (building interior lights off) utilizing simulated flares, infra-red, or white light searchlights. The targets offer frontal and flank shots, moving and stationary. The range will accommdate two M60 tanks simultaneously, and is controlled from a central control tower that has radio communications with the firing tanks as well as the capability to control all operating aspects of the range. Total cost of the facility was approximately $10,000.00. This relatively simple system allows armor crews to fire Tank Tables I

through IVA & B in a controlled environment, regardless of the weather.

The National Guard Bureau has now standardized the design of indoor tank ranges in what is known as a Multipurpose Indoor Range Facility (MIRF). The MIRF is designed to accomodate indoor weapons firing for personal and crew served weapons utilizing plastic ammunition. The MIRF is also designed to accommdate one M60 tank utilizing either the Tank Gunnery and Missile Tracking System (TGMTS) training device, or sub-caliber devices using plastic ammunition. Whether using the locally manufactured range or the commercially constructed, NGB approved range, the benefit to the Reserve Component tank crew is substantial. Significant crew drill and firing exercises can be accomplished without traveling long distances to major training areas.

Another example of soldier ingenuity is the in-bore sub-caliber device for the Combat Engineer Vehicle (CEV) designed and built by National Guard personnel and certified by Aberdeen Proving Grounds. During the late 1970's there was a critical shortage of main gun ammunition for the CEV. This shortage precluded any meaningful range firing by CEV crews. Investigation showed that the 75 MM Pack Howitzer high explosive (HE) round, using charge two, approximated the firing ballistics of the CEV round. Additionally, the 75 MM tube would fit inside the 152 MM tube of the CEV. The howitzer tube had to be removed from the carriage and necessary support collars and locking devices designed and

machined to support the 75 MM tube inside the CEV 152 MM tube. All of this was done by full-time National Guard employees. The result was an in-bore sub-caliber device that did everything required to train the crew in CEV gunnery. Although this was not adopted Army wide because of a shortage of 75 MM ammunition, it did provide an interim training vehicle for certain National Guard units until sufficient quantities of 152 MM training ammunition became available.

Until this time, the effort to develop specific training technologies for the Reserve Component has generally been non-existant. Training technologies developed for the Active Army have been applied directly to, or have been modified for the Reserve Component with varying degrees of success. In August of 1983, the Under Secretary of the Army proposed university level involvement in solving the training problems of the Reserve Components. This proposal was made to Dr. William Keppler who was both a Dean at Boise State University, Boise, Idaho, and a Civilian Aide to the Secretary of the Army for the Sixth Army area. With Dr. Keppler and Dr. Ruth Phelps of the Army Research Institute (ARI) doing most of the ground work, the Under Secretary approved a joint Training and Doctrine Command (TRADOC)/ARI/NGB/Office, Chief Army Reserve (OCAR) effort to conduct training technology transfer for the Reserve Component in October 1984. The location was to be at Boise State University, and the initial participants would be the

National Guard and Army Reserve units located throughout Idaho. TRADOC had already established the Training Technology Agency (TTA) and its field activities (TTFA) which are dedicated to identifying, coordinating, evaluating and implementing training research and institutionalizing successful results and products to improve training. A new TTFA was established at Boise State University and Gowen Field, ID for the purpose of extending this activity to the Reserve Component.[7]

The problem is how to take a soldier who has a minimum of 39 training days per year, limited resources, located in dispersed and sometimes remote locations and achieve individual and ultimately, unit readiness. At the first annual Reserve Component Training Technology meeting, conducted in November 1985, it appears initially that the major training problems impacting the Reserve Component are:

- MOS training
- Displaced equipment training
- Simulation/simulator effectiveness
- Junior leader training
- Technology transfer
- Individual ready reserve (IRR)
- Training locations

However, further work must be done to identify, verify and expand the list of Reserve Component training problem priorities in the operational environment.

This study of Reserve Component training problems and the attempt to at least partially alleviate those problems by the several agencies involved, is one of the real bright spots in Reserve Component training. Now for the first time, the resources of the Army are actively being used to find new and better training technologies that, hopefully, will answer directly the question of how to train the Reserve Component better in their unique environment.

The National Guard and DA have several completed or ongoing initiatives in the training device/simulator field:

- During FY 84 NGB spent $10.5 million to procure 23 company sets of MILES.

- During FY 85 DA spent $15 million to procure 1080 Video Disc Gunnery (VIGS) devices of which, 323 went to the National Guard.

- During FY 86 NGB has $53 million in a PDIP to fund procurement of

  - 181 platoon sets of MILES (1 per battalion).

  - 109 TGMTS (1 per tank battalion, or 2 in battalions with a large geographical area).

  - 279 Stinger Launch Simulators (STLS) (1 per unit authorized the Stinger missile).

  - 104 Dragon Launch Effects Simulator (LES) (1 per combat maneuver battalion).

  - 4 unit sets of DS/GS maintenance trainers for the new Regional Maintenance Training Sites (RMTS).

- 450 XM81 chemical detector simulators (1 per combined arms battalion).

Additionally, NGB is fielding the Mobile Conduct of Fire Trainer (MCOFT) for the M1, M2/3 and M60A3 as follows:[8]

FISCAL YEAR	86	88	89	90	91	93
M1	2	3			2	
M60A3		7	20	27	7	
M2/3	1	2		2		3

The concept of the MCOFT program for the National Guard is to provide not only a home station training vehicle that allows the crew to work together during Inactive Duty Training (IDT) to hone all aspects of crew drill, but also to provide additional opportunities to work together during other than IDT. As it is now conceptualized, the battalion MCOFT will be located at each subordinate company for a two week period every two months. Each crew will be allocated 6 Additional Training Assemblies (ATA) each year. These will be utilized one every two months for the purpose of helping to increase crew proficiency. The program in each battalion will be managed by a battalion training NCO who will be responsible not only for the MCOFT, but for all unit devices and simulators. At the company level, the full time training NCO will be the primary trainer for the MCOFT and will have the responsibility for scheduling crews for ATA's.

GUARDFIST is a new National Guard simulator initiative. GUARDFIST stands for Guard Full-crew Interactive Simulation Trainer. This development couples video disc players to the

outside of the drivers periscope, gunners sight and the tank commanders sight of the M60 tank. This allows each crew member to have a 240 degree field of vision. The crew will be able to engage targets with the main gun and see the rounds impact. The GUARDFIST program is on track at the present time, with expected fielding in FY89 or early FY 90.[9]

Most of our emerging technology in the training field is directed at the combat units. However, there are developments which will provide Reserve Component maintenance units an opportunity to train using simulators. Currently 60% of the non-divisional maintenance units are located in the National Guard, however, these units have very limited opportunities to train on the main battle tanks that they will be expected to maintain during wartime. The NGB intends to rectify this problem by establishing 15 Regional Maintenance Training Sites (RMTS). These 15 sites will be equipped with the following training devices:

- M1 Tank Turret Organizational Maintenance Trainer (TTOMT).

- M1 Turret Organizational Maintenance Trainer (TOMT).

- M1 Tank Turret Electrical and Hydraulic Maintenance Trainer.

- M1 Tank Ballistic Computer/Laser Rangefinder Maintenance Trainer.

- M1 Tank Turbine Engine Maintenance Trainer.

- M1 Tank Transmission Maintenance Trainer. These devices will allow for fully integrated transition training and sustainment training and provide fully trained deployable maintenance units capable of performing their wartime missions. RMTS will be located as follows:

SITE	YEAR	SITE	YEAR
Fort Dix, NJ	FY87	Camp Shelby, MS	FY87
Fort Bragg, NC	FY87	Camp Dodge, IA	FY87
Camp Roberts, CA	FY88	Camp Blanding,FL	FY88
Fort Stewart, GA	FY88	Fort Custer, MI	FY88
Camp Perry, OH	FY89	Camp Ripley, MN	FY89
Fort Riley, KS	FY89	Fort Ruger, HI	FY89
Gowen Field, ID	FY90	Fort Drum, NY	FY90
Weldon Springs, MO	FY90		

In addition, the Army plans to place six additional RMTS at FORSCOM and TRADOC locations and two high tech RMTS at AMC locations. These will help train the USAR and Army non-divisional maintenance units.

10

Looking into the future and conceptualizing new devices and simulators to meet new needs is one of the jobs of the Defense Advanced Research Projects Agency (DARPA), which is currently developing the DOD technology base for the large scale networking of military training simulators. This technology will permit regular and intensive practice of combat skills by large teams, and is viewed as an essential technology for the future preparedness of U.S. combat

forces. DARPA's focus has been on developing new technological approaches for training critical combat skills where the solution enables regular and intensive practice, yet at a fraction of the cost (capital and operating costs) of current approaches.

DARPA's latest initiative in this area is the SIMNET program. The objective of SIMNET is to develop the DOD technology base for distributed, multi-player, real-time, continuous gaming where large numbers of combatants in simulated weapon systems, command posts, and at other locations are networked by computer such that :

- Force-on-force battalion level combat can be practiced.

- Collective skills inherent in squads, crews, and platoons can be practiced.

- Command and staff tasks and leader tasks can be practiced and evaluated within the context of individual soldier actions in a multi-echelon environment.

- Clusters of simulators (company and battalion level) can be widely separated (each combatant can remain at his home base).

- Weapon system performance factors and tactics can be changed to evaluate combat developments for future systems.

- Dress rehearsals for real contingencies can be practiced.

[11]

It's apparent, based on the foregoing that National Guard requirements must be included in all future training

device developments. The training devices must be affordable; they must simulate operation of the actual piece of equipment and train more than one or two soldiers at a time. Those devices which are too costly or which have dedicated manpower constraints must be located at regional training sites. As the Army utilizes more resources to develop and field devices and simulators, the National Guard can expect to receive its share to support its unique training requirements. With this increase,and proper emphasis by the commander and utilization by soldier, we will see an increase in individual, crew, and unit proficiency and readiness. The end result will be a National Guard better equipped to execute its wartime missions.

ENDNOTES

1. NGB-ARO-TS Information Paper, Ensuring that the Justifcation for the Development of Training Simulations and Devices for Use in the Field considers the Unique Training Needs of the Reserve Components, pp. 1.

2. Ibid., pp. 1.

3. Ibid., pp. 2.

4. Paul Deason with BG Robert Sunell and MAJ Michael Robinson, Guns Over Boise: Snake River Shoot-out Phase, pp. 2-3.

5. Ibid., pp. 10. 6. Joanne L. Barreca, DOD Acquisition of Simulators and Training Devices: Support the System, pp. 5.

7. Dr. Ruth Phelps, U.S. Army Research Institute Briefing on Boise TTFA.

8. NGB-ARO Briefing, ARNG M-COFT Program.

9. NGB-ARO-TS Briefing, Guard Unit Armory Device Full-Crew Interactive Simulation Trainer (GUARDFIST).

10. NGB-ARO-TS Briefing, Regional Maintenance Training Sites.

11. Defense Advanced Research Projects Agency, SIMNET Program Review, January 1985, pp. 1-3.

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